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ANNULARIA WITH PALEOSTACHYA FRUIT

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(WITH TWO FIGURES)

Among the most common fossil plants in Rhode Island are Annulariae, thought to be allied to the modern *Equisetum*. While the Annulariae or leafy shoots are seldom found attached to their supposedly Calamitean stems, the trunks of these ancient cryptogams are often seen in the coal strata and occasionally prove to be of large size. Much more rare, however, are the fruiting stalks of these primitive plants, one specimen of which has appeared from the coal shales of Rhode Island. This fossil is regarded by the writer as a new species of *Annularia*, both from the character of its foliage and the nature of its fruit.

Annularia clarkii, n. sp.—In considering the affinities of the leafy shoots of *Annularia clarkii* one may cite *Asterophyllites lentus* Dawson.¹ The Canadian material, however, is so fragmentary that correlation therewith is questionable. The fertile stalks of *Annularia clarkii* resemble in many ways *Paleostachya* (*Volkmannia*) *gracilis* Renault,² especially in the position of the sporangia, which appear to be borne in the axils of the leaves. The sporangiophores of the European species, however, are shorter and less stout than those of the Rhode Island plant (figs. 1, 2).

In a recent publication³ statements are made to the effect that Calamariae, to which the Annulariae supposedly belong, show four main types of fruiting. The first includes *Calamostachys*, forms in which the cones are made up of fertile and sterile parts, the sporangiophores being placed midway between the leafy bracts. The second or *Paleostachya* type consists of cones, the fertile parts of which are borne in the axils of the sterile bracts. The third or *Cingularia* type is characterized by sporangiophores borne just under

¹ Bull. Nat. Hist. Soc. N.B. 6:247. 1910.

² RENAULT, B., Autun 2:75. pl. 29. figs. 1-7. 1893.

³ SCOTT, D. H., Studies in fossil botany. Ed. 3. Vol. I. p. 43. 1920.

the sterile whorls. The fourth has a sporangiophore without bracts, or arranged as in the modern *Equisetum*. The same author states

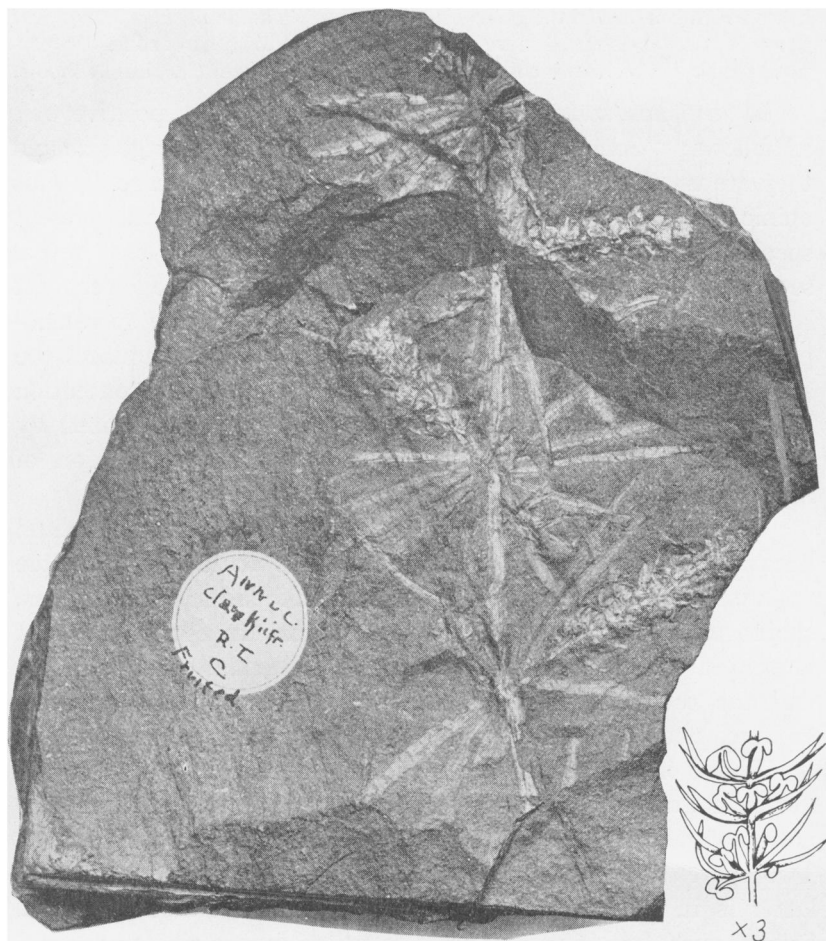


FIG. 1

FIG. 2

FIGS. 1, 2.—Fig. 1, *Annularia clarkii*: photograph, natural size; fig. 2, *Annularia clarkii*: drawing, $\times 3$.

further that “in all cases where fructifications have been referred to *Annularia* . . . they have been proved to be of the *Calamostachys* type.”

Another English author⁴ of earlier date, however, states the situation less sweepingly, as follows:

It would appear . . . that the *Annularia* type of branch usually bears cones which conform to the genus *Calamostachys* (*Stachannularia*); . . . But this rule is not constant, and we are not in a position to speak of cones of a particular type as necessarily characteristic of definite types of Calamitean shoots.

BERRY⁵ has stated the problem in a still more positive way as follows: "Some of the *Paleostachya* cones are of large size and they are usually associated with *Annularia* type of foliage." This opinion is further borne out by the characteristics of the present species, *Annularia clarkii*. The illustrations of this fossil reveal several fruiting cones attached to their leafy shoot, the lower right hand one being sufficiently distinct to show that the sporangio-phores spring from the axils of the leaves. This fact places the specimen in the *Paleostachya* group, and refutes the contention by SCOTT that *Annulariae* have always been characterized by *Calamostachys* types of fruiting. The following description of *Annularia clarkii* is offered:

Verticilli 10-12 foliorum circa quemque nodum; quodque folium linearium 4 cm. vel longum paullum, apices acuti, mediae costae apparent; fructus ramus quemque nodum quasi 4.5 cm. longus, sporangio-phorae quasi 1 mm. longae. Duae fruges annectae sunt alterno lato stili curvati. Hic ultimus in axilla curvae bractae lineariae est, quae fructum superarcuant. Plurimi stili sporosi ex unico nodo enascuntur.

Whorls of 10-12 leaves at each node; each leaf linear, 4 cm. or less in length, apex acute, midrib present; fruiting branch at each node about 4.5 cm. long, the sporangio-phore about 1 mm. long. Two spores are attached on either side of a curved stalk. The latter is in the axil of linear bracts which overarch the fruit. Several spore-bearing stalks seem to spring from a single node.

Sterile fossils of this species are very common from the Pawtucket, Valley Falls, and Portsmouth sections of Rhode Island, and may be found in the Brown University collection. The fruited specimen used as the basis of this article is now a part of the Roger Williams Park Museum collection, Providence, Rhode Island.

⁴ SEWARD, A. C., Fossil plants. Vol. I. p. 364. 1878.

⁵ BERRY, E. W., Paleobotany: A sketch of the origin and evolution of floras. p. 319. 1920.